



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

<b>Name(s)</b> <b>Christopher Liebe; Liam Wright</b>	<b>Project Number</b> <b>J1715</b>
<b>Project Title</b> <b>Is Fire a Plasma?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives</b> This project determines if fire is a plasma by testing if a flame can carry an electrical current through an open gap. The flame is provided by a blowtorch. It is expected that when the flame is hot enough, (closest), the flame will be a plasma and will connect the circuit and the multimeter will show a conductive path.</p> <p><b>Methods</b> Two alligator clips from a multimeter attach to washers clamping Tungsten filament (from a lightbulb) over an open gap of 2cm. A blowtorch is held at varying distances away. The distance is measured in centimeters and is determined from a ruler running from the base of the flame to the Tungsten filament.</p> <p><b>Results</b> From nine or more centimeters away from the base of the flame, a plasma was not present. However, when the base of the flame was eight or fewer centimeters away from the Tungsten filament, the flame was hot enough for a plasma to be made and the multimeter to show a reduction in resistance.</p> <p><b>Conclusions</b> In conclusion to this experiment, a flame can be a plasma where it is hot enough. When the Tungsten is zero to eight centimeters from the base of the flame, the flame creates the plasma environment. However, the relationship isn't proportional. This could be from the added resistance of Tungsten as a conductor caused by the heat of the flame. From nine or more centimeters away from the Tungsten filament, the flame is unable to produce a plasma because it is not hot enough.</p>	
<b>Summary Statement</b> Using electrical resistance to determine the state of matter of a flame.	
<b>Help Received</b> Our parents helped us to handle the blowtorch safely and how to use the multimeter correctly. We obtained lightbulb filaments, built the test stand and conducted the experiments ourselves.	